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tiles, Actinodon, Protriton and Stereorachis, are now known from these beds.

Secondary.—The central region of Tunis, according to M. Rolland, consists in great part of a mass of senonian beds with limestones yielding inocerami and cephalopods. This mass is here and there capped by nummulitic beds. These beds are found all around the Mediterranean region, but those of Algiers and Tunis are characterized by peculiar species.——M. Thomas has discovered beds of phosphate of lime in Tunis. In the south-west are rich and very extensive Eocene deposits, while near Feriana there is a small bed of Cretaceous age. In the Albian marls of Constantine, in Algeria, there are notable Cretaceous beds of this mineral.

Quaternary.—M. Reviere, who at the meeting of the French Assoc. Adv. Sci. at Grenoble, in 1885, gave a list of 171 shells discovered in the grottoes of Meudon, has this year described the fishes and birds. The few fishes found are principally those of fresh water, which seems inexplicable among peoples living on the shore of a sea so rich in fishes as the Mediterranean. The vertebra of a salmon, a fish of the northern rivers, was found, and speaks of the migrations of these Quaternary peoples.

MINERALOGY AND PETROGRAPHY.[1]

New Books.—The third part of Professor von Gümbel's "Geologie von Bayern"[2] has just been received. Although not yet completed, enough of the first volume has already appeared to show that the work in its entirety will fill a long felt want. In this volume the author proposes to set forth the principles of geology as generally accepted at the present time, devoting quite a considerable portion of the book to the microscopical characteristics of rocks, and to the truths which the microscope reveals, as well as to the theories to which the use of this instrument has given rise. That portion of the book which has already appeared is well illustrated by nearly four hundred photo-engravings. Most of these illustrations are taken from localities in Bavaria. The author, however, has not hesitated to draw on any source that would serve his purposes better than those at hand in his own country. The result is a most satisfactory text-book of geology, in which all the most modern methods of geological research are described, and the results to which each leads carefully given. The subject of metamorphism has received considerable attention and also the theories relating to "petrogenesis," or the origin of rocks. The second volume will be devoted to a description of the geology of Bavaria.——The first of a series of monographs on edu-

[1] Edited by Dr. W. S. Bayley, Madison, Wisconsin.

[2] Geologie von Bayern. Bd. I, Lief, I, II, III, Grundzüge der Geologie. Dr. K. W. von Gümbel. Cassel, 1884-6.

cation has recently been published by Heath & Co., of Boston.[1] It is a neat little book of thirty-five pages, intended primarily to call the attention of teachers to the rise and development of the youngest branch of geological science, and to the methods which are made use of in it. A very large amount of information relating to the history of petrography is embraced within the first twenty-five pages of this little volume. The next five pages contain a list of the most important works devoted to the subject and the periodicals in which petrographical articles are published. In the remaining pages the methods made use of in the preparation of thin sections are described and the names of reliable dealers in the instruments and materials used, with the cost of these, given.

MINERALOGICAL NEWS.—Ptilolite[2] is a new mineral, described by Cross and Eakins, from Colorado. It occurs in the cavities of a vesicular augite-andesite found as fragments in the conglomerates of Green and Table mountains, in Jefferson county. It forms delicate tufts and spongy masses composed of short hair-like needles which are usually deposited upon chalcedony in the pores of the rock. Under the microscope these needles are seen to be colorless, transparent prisms about .001^{mm} in diameter, terminated by a basal plane. Their extinction is parallel to the prismatic axis. An analysis of the purified material yielded Mr. Eakins the following result:

SiO_2	Al_2O_3	CaO	K_2O	Na_2O	H_2O
70.35	11.90	3.87	2.83	0.77	10.18

This corresponds to the formula Ro Al_2O_3, $10SiO_2 + 5H_2O$. The mineral is interesting as being the hydrated form of the most acid anhydride known among the silicates, with the exception of the rare mineral milarite.——A pseudomorph of limonite after pyrite[3] recently found in Baltimore county, Maryland, contains six of the seven possible crystallographic forms of the regular system. The forms actually observed are O, $\infty O\infty$, $\left[\frac{\infty O 2}{2}\right]$, $\left[\frac{4O2}{2}\right]$, 2O2, and 3O. The fact that only two planes of the forms $\left[\frac{4O2}{2}\right]$, 2O2, and 3O are developed in each octant imparts to the crystal an orthorhombic symmetry.——The turquoise from Los Cerillos, New Mexico, has been studied chemically and microscopically by Messrs. Clark and Diller,[4] of the United States Geological Survey. It occurs imbedded in a fine-grained red orthoclase rock with a microgranitic structure, sometimes in

[1] Modern Petrography. An account of the application of the microscope to the study of Geology, by G. H. Williams, 1886.

[2] Whitman Cross and L. G. Eakins. Amer. Jour. Sci., XXXII., Aug., 1886, p. 117.

[3] On a remarkable crystal of pyrite from Baltimore county, Md. Geo. H. Williams. Johns Hopkins Univ. Circulars, No. 52, 1886.

[4] Amer. Jour. Sci., XXXII., Sep., 1886, p. 211.

nodules, but more frequently in seams and veins. In color it ranges from sky-blue, through greenish-blue, to dark-green. Analyses of specimens of these three varieties yielded:

	Bright blue.	Greenish blue.	Dark green.
H_2O	19.80	19.60	18.49
Al_2O_3	39.53	36.88	37.88
Fe_2O_3		2.40	4.07
P_2O_5	31.96	32.86	28.63
CuO	6.30	7.51	6.56
SiO_2	1.15	.16	4.20
CaO	.13	.38	

Upon comparing these results with those obtained by other investigators, the authors conclude that normal turquoise can be represented by the formula $Al_2HPO_4(OH)_4$. The various colors which it possesses are probably due to the admixture of a copper molecule $2CuO\ P_2O_5\ 4H_2O$. The presence of iron salts would tend to give a greenish tinge to the mineral. Under the microscope it was seen to be composed of minute grains or short thick fibers, weakly doubly refracting, with a high refractive index. The extinction was parallel to the long axes of the fibers. A consideration of the arrangement of the fibers in the veins, the composition of the rock in which the mineral is found, and its association with epidote, lead the authors to the supposition that it may have been derived from apatite.[1]

PETROGRAPHICAL NEWS.—The gabbros occurring near Baltimore, and the hornblende rocks associated with them have been made the subject of a bulletin of the U. S. Geological Survey.[2] The treatment of these rocks by the author is very thorough. The paper opens with an introduction calling attention to the fact that eruptive rocks may, under the influence of heat and pressure, become schistose and in their characteristics very like the crystalline schists which have been derived by the alteration of aqueous formations. The main portion of the work is devoted to the tracing of hypersthene gabbro into a schistose rock, called by the author gabbro-diorite. The massive gabbro consist essentially of a fine to coarse grained mixture of bytownite, light-green diallage and hypersthene in varying proportions. In addition to these there are also contained in the gabbro a little yellowish-brown hornblende, strongly pleochroic and full of minute black inclusions,[3] some magnetite and in a few instances considerable apatite. By alteration of the diallage and hypersthene into a fibrous hornblende the gabbro passes gradually into a schistose rock, containing in addition to the plagioclase and hornblende a considerable amount of epidote and some garnet, apatite, rutile, sphene, etc. In the case of the alteration of hypersthene the author supposes a reaction to have taken place between this

[1] Cf. AMERICAN NATURALIST, January, 1886, p. 61.
[2] Dr. G. H. Williams, Bulletin of the U. S. Geol. Survey, No. 28.
[3] Cf. AMERICAN NATURALIST Notes, March, 1886, p. 275.

mineral and the feldspar of the rock, the latter supplying the former with the necessary aluminum required to build up the hornblende molecule. In addition to the two rocks mentioned, there are in the same region olivine-bronzite-gabbros, feldspathic peridotites and lherzolites. In some of these rocks the feldspar has undergone a rather unusual alteration, viz., into scolecite. Other rocks, composed entirely of bronzite or hypersthene with or without diallage, are mentioned and briefly described. These olivine and pyroxenic rocks have given rise to much of the serpentine so generally found in their neighborhood.——In the August number of the American Journal of Science, Mr. J. S. Diller[1] has an article on the peridotite of Elliott county, Kentucky. This rock, according to the author, occurs in well-marked dykes cutting Carboniferous sandstones and shales. A microscopic examination shows it to consist of olivine and pyrope, with a small amount of ilmenite as primary constituents, and serpentine, dolomite, magnetite and octahedrite as secondary minerals. The interesting fact is noted that around the garnet a reactionary rim exists analogous to the kelyphite[2] of Schrauf. Instead of amphibole, however, the fibrous mineral in the rim is biotite. From a comparison of the composition of the peridotite and the intersected sandstones and shales and the discovery of both endomorphous and exomorphous changes (mica and spilosite in the shales, and a variolitic structure in the peridotite) in the neighborhood of their contact, the author concludes that the peridotite is without doubt an intrusive mass and eruptive in its origin.——Mr. Geo. F. Becker[3] has replied to the article of Messrs. Hague and Iddings[4] on crystallization in the igneous rocks of the Washoe district. The author of the present paper denies the validity of many of the results of Messrs. Hague and Iddings, and claims that a second visit to the Washoe region and a reëxamination of the rocks collected there have established him firmly in the belief that the granitoid and the glassy rocks are of entirely distinct eruptions, which took place at two different periods remote from each other, and that in many cases minute differences of chemical composition have produced effects greater than moderate differences in the depths at which the rocks cooled. He moreover claims that a mere study of the slides and hand specimens is not sufficient to overthrow his own theory of the succession of rocks in the vicinity of the Comstock lode.——Professor R. D. Irving, of the United States Geological Survey, in an article in the American Journal of Science,[5] maintains that the iron ores and the associated jaspery schists of the Lake Supe-

[1] Amer. Jour. Sci. XXXII, Aug., '86, p. 122.
[2] Cf. AMERICAN NATURALIST Notes, Feb., 1886, p. 161.
[3] Bulletin 6, California Academy of Sciences, p. 93.
[4] Cf. AMERICAN NATURALIST Notes, Dec., 1885, p. 1216.
[5] Origin of the ferruginous schists and iron ores of the Lake Superior region. Amer. Jour. Sci., XXXII., Oct., '86, p. 255.

rior region were derived from an original iron carbonate which was interbedded with carbonaceous shales which were themselves often impregnated with the same mineral. By a process of silicification these carbonate-bearing layers were transformed into the various kinds of ferruginous rocks now met with in this region. In some cases silicifying waters decomposed the iron carbonate in place, producing tremolite or actinolite and magnetite, which with the excess of silica remaining formed the actinolitic schists so frequently found associated with the iron ores. In other cases direct oxidation of the carbonate gave rise to bodies of hematite. In still other cases during the silicification of the rocks and the decomposition of the carbonate, the iron was removed by leaching and deposited in other places as it became oxidized. The jasper is supposed to be secondary and to have been deposited upon the removal of the iron carbonate in the process of silicification. The various theories which have heretofore been put forward to account for these interbedded iron and jasper layers are all in turn examined and pronounced insufficient to explain the phenomena met with everywhere in the study of the region.

BOTANY.[1]

THE WIND AND THE TREE-TOPS.—Since 1875 the writer has observed, in various parts of the country, 156 instances of injury to the trunks or branches of trees by wind.

Of all ordinary trees the common red maple appears to suffer most in hard winds, and the whole 156 observed cases of injury were confined to the various species of deciduous trees. The writer has seen hundreds of long-leaf pines in Georgia and Florida that had been blown up by the roots, but not one injured in trunk or branch while the tree was yet standing. Also close inquiry in Iowa and a whole summer's observation among the white pines of Tennessee failed to reveal a single case in which a tree of that species was injured by the wind. Of the 156 observed instances of injury sixty-one per cent were limbs split off at the crotch.

The crotches of a tree are its weak points. Nature recognizes this fact and guards against the weakness by swelling out the wood about the points of branching. Notably is this true of the white pine. In a large tree of this species the limbs come out in regular whorls about two feet apart. Midway between each two successive whorls the central axis of the tree has a minimum size. Above and below this point of least circumference the trunk gradually swells out to support the successive sets of branches.

In sixty per cent of the observed injuries the trunk divided into two or more large nearly equal branches, and one of these

[1] Edited by Professor CHARLES E. BESSEY, Lincoln, Nebraska.